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STEPHEN R. ROSS

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: Comments of InterMedia Partners
ET Docket No. 93-7

Dear Ms. Searcy:

Enclosed on behalf of InterMedia Partners, are the original and nine copies of InterMedia's Comments in the above-referenced proceeding. InterMedia respectfully requests that the Commission accepts these comments, filed one-day late, as a formal submission. InterMedia submits that the information provided in thse comments is responsive to the Commission's Notice of Inquiry and consideration of these comments and their placement in the formal record in this proceeding will serve the public interest.

Please address any questions concerning this letter to the undersigned.

Sincerely yours,

Stephen R. Ross

KAH/mec
Enclosure

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List A B C D E

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of:	)	
	)	
Implementation of Section 17 of the Cable	)	
Television Consumer Protection and	)	ET Docket No. 93-7
Competition Act of 1992	)	
	)	
Compatibility Between Cable Systems and	)	
Consumer Electronics Equipment	)	

SUMMARY

InterMedia Partners, operator of cable systems serving over 600,000 subscribers in 11 states (InterMedia), respectfully submits its comments in response to the ***Notice of Inquiry*** issued on January 29, 1993, in the above referenced proceeding.

The specific requirements for consumer-friendly delivery of cable services must be considered together with other requirements, specifically the need to deliver a basic service tier which, because of the channel position options available to local broadcast stations, may include non-contiguous channels. In addition, the need to comply with the 1992 Cable Act's anti-buy through provisions must be considered.

Available technologies include modifications to current set-top converters, broadband delivery mechanisms and the ANSI/EIA 563 interface connector. While all offer the degree of functionality required by the Act, no single solution will be optimum for all systems. The most promising solution, for systems using scrambling, is the decoder interface connector. This technology not only offers a high degree of compatibility, but also offers a smooth transition to advanced television and the delivery of digitally compressed signals.

Most of the improved technologies require direct connection between cable systems and consumer equipment. In order for consumers to realize the benefits of the improved compatibility, however, their equipment must perform satisfactorily in the cable television environment. For that reason, the Commission must specify the features and performance of equipment designed for direct connection to cable systems, as provided for in the 1992 Act.

InterMedia suggests that three classes of performance must be specified: those things which insure a lack of interference to others, those things which assure a minimum level of performance, and those thing that improve compatibility. The performance levels suggested are not unreasonable and, in fact, are met by nearly all cable converters in use today. InterMedia believes the best overall solution to the compatibility issue is the consumer interface plug. While the interface connector is a fully released standard, it requires mandatory inclusion on equipment in order for customers to benefit from its advantages.

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BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of:	)	
	)	
Implementation of Section 17 of the Cable Television Consumer Protection and Competition Act of 1992	)	ET Docket No. 93-7
	)	
Compatibility Between Cable Systems and Consumer Electronics Equipment	)	

RESPONSE TO NOTICE OF INQUIRY

InterMedia Partners, operator of cable systems serving over 600,000 subscribers in 11 states (InterMedia), hereto respectfully submits its comments in response to the ***Notice of Inquiry***, FCC No. 93-30, released January 29, 1993, in the above referenced proceeding.

I. INTRODUCTION

In the NOI, the Commission asks several specific and several more general questions regarding the compatibility and signal security issues between cable television systems and subscribers' reception equipment. Since subscribers ultimately pay the cost of both changes to cable systems and their reception equipment, the ultimate question is: What is the most cost-effective manner of securing and selectively delivering a variety of cable services in a way that least disrupts reception equipment features?

InterMedia suggests that the optimal solution, as the Act[1] has anticipated, requires rules governing cable system operations as well as specified features and performance of consumer equipment designed for direct connection to cable systems. InterMedia also suggests that, with respect to cable systems, the optimal solution may not be the same in all systems, varying with size, density, and currently installed security systems, among other factors. Finally, InterMedia suggests that solutions are available that will allow a smooth transition to Advanced Television (HDTV) and the delivery of digitally compressed television. Owing to the broad and interrelated

II. BACKGROUND OF THE CONSUMER INTERFACE PROBLEM

The NOI requests data on the effect of current security practices on the ability of subscribers to access features of their reception equipment. This section discusses the background of the problem. The later section on available alternate technology expands on that and discusses the cost and relative advantages of other security and control methods.

Since the early days of cable, operators have protected their services with traps[2], both positive and negative. Traps are very consumer friendly, in that they deliver all subscribed services in parallel and avoid the problems of converters. For many operators, especially smaller operators, they are still the method of choice. On the other hand, security (especially with positive traps) is very limited and the effect on picture quality is noticeable. Traps are also labor intensive and almost totally preclude PPV sales. Finally, because of the lack of adequate shielding in many television sets, converters are sometimes required anyway, just to overcome direct pickup problems.

Most cable operators in larger systems have

report that detailed existing and some proposed solutions to these problems.[3] Few of these solutions were implemented because all solved some part of the problem at the expense of added complexity of equipment and none offered a complete solution.

In the same period, the Electronic Industries Association (EIA) and NCTA formed the Joint Engineering Committee (JEC) to deal with all of the interface issues. The group worked in three specific areas related to consumer interface issues:

- ***A Uniform Channelization Standard: IS-6.*** To eliminate confusion among several numbering schemes, this standard spells out a unique relationship between channel number and frequency. It was adopted and is in the process of obtaining full ANSI certification. Additionally, an extended standard is being released which extends IS-6 to cover the new channels in use in extended bandwidth cable systems.

- ***A Post-Tuner Port in Consumer Equipment for Descrambler Attachment: ANSI/EIA 563.*** Since most of the interface problems arose from placing the converter's tuner ahead of the tuner in TVs and VCRs, adding a port to consumer equipment *after* the tuner would allow a lower-cost "black-box" descrambler to be placed on the back of the set. While the standard was adopted, it has not been widely implemented because of a "chicken-and-egg" problem that requires a significant concentration of both consumer equipment and converters that conform to the standard to make it useful. This option will be discussed in detail below. Meanwhile, the standard itself is under discussion to see what extensions will be necessary to accommodate digital transmission.

- ***A Definition of the Desirable Characteristics of Reception Equipment to be Connected to Cable: IS-23.*** The third effort was to acquaint each industry's engineers with the technical requirements and limitations of the other. The resultant document ***CATV RF Interface Specification for Television Receiving Devices*** contains information on delivered signal levels and their variation, tuning range, shielding required, local oscillator leakage and other parameters needed to assure a trouble-free connection to a cable system. This document is under active negotiation (and has been since before 1985) and, when finished, will contain much of a functional definition of a "cable-ready" device.

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[3]*Connecting Cable Systems to Subscriber's TVs and VCRs-Guidelines for the Cable Television Industry*, issued by the NCTA Engineering Committee's Subcommittee on Consumer Interconnection, 1987.

III. CURRENT OPERATOR PRACTICE

The NOI asks for specific data on current practices:

- How many channels of service are provided on a cable and what frequencies are used for delivery of these channels?

  Among the approximately 160 cable plants operated by InterMedia are systems as small as 50 subscribers and as large as 80,000 subscribers. The smallest of these systems offer only 12-20 channels of programming while the largest have 82 channel capability. Without exception, all conform to the frequency plans set forth in EIA IS-6 for video channels and with the required offsets and tolerances contained in the FCC's rules for use of aeronautical frequencies.

- In what circumstances and to what extent are dual cables used to deliver services?

  Among the InterMedia systems, only two were constructed with two distribution cables. Neither system uses the second cable for video programming.

- What methods and technologies do cable systems use to prevent theft and unauthorized reception of service? What are the operating principles used in each of these approaches?

  Basic Service. In all InterMedia systems, access to the lowest level of service is controlled by the physical connection and disconnection of the drop cable to the dwelling.

  Tiers. Prior to the enactment of the Act, control of access to higher tiers (groups of channels, as opposed to single-channel premium services) has been controlled, in the vast majority of cases, by use of band-pass or band-reject filters which pass only a portion of the total bandwidth to subscribers. Given the simultaneous channel positioning and anti-buy-through provisions of the Act, this cost-effective solution may no longer be possible.

  Premium Services. Access to individual premium channels is controlled by one of three methods:

  -***Negative traps*** (defined and discussed later under options for consumer-friendly delivery)
  -***Positive traps*** (also discussed in the later section)
  -***Scrambling*** at the headend and selective descrambling in a set-top descrambler. At least four technologies are used by various systems. All work by modifying a standard NTSC video signal so that it is not recognizable to a standard television set or VCR.

- What proportion of cable systems (and the number and proportion of subscribers affected) use each of the available security methods and technologies? How many units use converter units for either security or other purposes, such as elimination of direct

pick-up interference in receivers, and how may and what percentage of subscribers on those systems are using converters?

As stated above, virtually all InterMedia systems use some traps for protection of tier programming, though that may change depending on the outcome of this and other related rulemakings.

In the case of control of premium services, some InterMedia systems use traps, some scrambling and some a combination of both. The following table summarizes our usage of the various technologies:

	TRAPS	SCRAMBLING	BOTH
SYSTEMS (%)	69	25	6
SUBSCRIBERS (%)	39	48	13
SUBSCRIBERS (#)	234,000	287,000	81,000

Our use of set-top boxes is summarized in the table below. For purposes of this table, set-top boxes are divided between those whose primary purpose is selective descrambling of premium services (descramblers) and those whose only purpose is providing additional features for customers desiring them or solving reception problems in cases of inadequately shielded consumer equipment (converters). Since many customers have more than one box (for multiple sets), the number of customers using boxes will be substantially smaller than the total number indicated below.

	DESCRAMBLERS	CONVERTERS
SET-TOP BOXES (#)	210,000	164,000

- What types of cable converters are currently available to cable subscribers commercially from third parties? To what extent to cable systems currently make converters and/or remote controls available for purchase by their subscribers?

  Converters are widely available from either electronics stores or through mail order. For that reason, InterMedia has not generally felt it necessary to offer them for direct sale to its subscribers.

  Descramblers, on the other hand, are tightly controlled as that is the only way InterMedia has of controlling access to premium services. The many ads in electronics magazines and acknowledged degree of pirate and modified descramblers on the market are ample evidence of the difficulty of maintaining control of premium service reception currently. Allowing subscribers to own premium descramblers would remove all effective control.

- To what extent are cable converters or other devices used by cable systems to resolve technical problems such as signal leakage?

  While InterMedia does not keep records on the number of converters that are installed for the purpose of solving problems of direct pickup in inadequately shielded consumers' equipment, some are used for that purpose in every market in which there are strong local television stations. It is unfortunate that these are required, as they render useless many of the customer's equipment features. Since the problem is created by the customer's equipment, however, there is no alternate solution.

IV. THE REQUIREMENTS OF THE ACT

The key consumer interface provision of the 1992 Act is found in Section 17 and states, in part:

> ***Within 1 year after the date of enactment of this section, the Commission, in consultation with representatives of the cable industry and the consumer electronics industry, shall report to Congress on means of assuring compatibility between televisions and video cassette recorders and cable systems, consistent with the need to prevent theft of cable service, so that cable subscribers will be able to enjoy the full benefit of both the programming available on cable systems and the functions available on their televisions and video cassette recorders. Within 180 days after the date of submission of the report required by this subsection, the Commission shall issue such regulations as are necessary to assure such compatibility.***

Several specific interface issues are enumerated:

- The ability to watch one channel while simultaneously recording another.
- The ability to do a timed recording of programs on different channels.
- The ability to use "advanced television picture generation and display features" (such as picture-in-picture, or PIP) of television sets.

In order to assure that the Commission has sufficient latitude to deal with all aspects of the issue, it was also given authority to mandate receiver functionality. In particular:

> ***The regulations prescribed by the Commission under this section shall include such regulations as are necessary . . . to specify the technical requirements with which a television receiver or video cassette recorder must comply in order to be sold as "cable compatible" or "cable ready";***

Thus, the FCC is allowed to consider solutions that might involve some modification to the characteristics of consumer equipment that is specifically designed (by the nature of its tuning range) to be connected to cable systems. At the very least, the Commission can deal with the existing problems (such as direct pickup of strong off-air channels, signal handling ability and

excessive VCR signal loss) that plague operators and their customers today. Equally important, they can consider solutions such as mandatory implementation of the ANSI/EIA Decoder Interface Connector, which has been slow to develop because of the lack of voluntary compliance.

The Commission's task is made more complicated by a number of other provisions in the new law which directly affect the interface problem:[4]

"Basic Tier" Service. The law establishes a basic tier of service which includes all off-air broadcast stations[5] plus PEG channels. Except where effective competition exists, this service will be rate-regulated, primarily by local authorities.[6]

Channel Position Requirements. Each local station demanding carriage under the "Must-Carry" provisions will be able to choose a channel position from among:

- Its over-air channel number,
- Its position on the system on July 19, 1985, or
- Its position on the system on January 1, 1992.[7]

Thus, unless the station agrees on a position that best works for the cable operator, the Basic Tier service may include several non-contiguous channels in the spectrum. Delivering this level of service while protecting other tiers of programming presents a further technical challenge, particularly in light of the consumer-friendliness provisions and the need to hold down the cost of the service. The situation is complicated even more by the potential need to continually modify the channel lineup of the Basic Tier as stations exercise their right (every three years) to choose between must-carry status and retransmission consent.

Anti-Buy-Through Requirements. As a further protection for subscribers to the Basic Tier service, operators are forbidden from requiring subscription to any higher tier of service as a pre-condition to buying a premium channel or pay-per-view event.[8] Thus, the operator is faced with the technical problem of selectively providing premium and PPV channels without giving away other tiered channels. The option of scrambling everything except the Basic Tier is the

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[4]Several provisions of the law have been challenged legally, but for purposes of these comments, it is presumed that all provisions of the 1992 Act remain effective.

[5]Stations received by satellite are not required to be in the basic tier.

[6]*Cable Act of 1992*, Section 623(b)(7)(A).

[7]*Cable Act of 1992*, Section 614(b)(6).

[8]*Cable Act of 1992*, Section 623(b)(8). It should be noted that cable operators who cannot technically comply are granted a ten-year exemption from this requirement.

most effective solution in addressable systems and yet this approach is not an optimal consumer-friendly method of delivering cable services. Under the law's provisions, the FCC is allowed to limit cable operators' use of scrambling if there are other methods available to control program access which are both technically and economically feasible.

Future Extensions to HDTV. The Commission is specifically directed to modify the Must-Carry rules to assure that cable operators carry local Advanced Television (HDTV) broadcast stations.[9] Thus proposed solutions should take into account this pending development.

Future Extensions to Digitally Compressed Signals. Beginning in late 1993 or early 1994, cable operators expect to provide digitally compressed television signals. While this technology may not be applicable to all markets, where it is used it will provide greatly increased programming choices for consumers. Solutions which offer an upgrade path for consumer-friendly reception of these new services should be considered.

V. TECHNOLOGIES FOR CONSUMER-FRIENDLY DELIVERY OF SERVICES

The NOI asks for information on methods of scrambling and encryption systems that do not interfere with the functions of subscribers' TV receivers, VCRs and other TV equipment. In a related question, it asks about the feasibility of connecting cable services directly to subscribers' reception equipment.

There are many technical approaches to the simultaneous problems presented by the Act, the needs of the EIA and NCTA member companies, and the extensions required to accommodate new technologies. Each will be examined for its ability to meet all these needs. The available solutions fall into three general groups:

- ***Modifications to Current Set-Top Technology.*** These solutions represent various incremental improvements to current set-top descramblers which overcome some of the problems. Most of these solutions deliver at least some of the channels directly to customers' television sets.

- ***Broadband Solutions Installed External to, or at the Point of Entry of the Residence.*** All of these solutions have as their goal the delivery of most or all programming simultaneously in descrambled form, so that no converter is required on the TV set.

- ***Solutions Based on the Descrambler Interface (ANSI/EIA 563) Connector.*** These solutions assume that such a connector becomes a mandated feature on cable-ready receivers, thus overcoming the start-up problems that have plagued this approach in the past. These solutions are predicated on delivery of the entire cable spectrum directly to

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[9] *Cable Act of 1992*, Section 614(b)(4)(B).

customers' television sets and VCRs, with the descramblers connected to an adapter connector on the back of the set.

SET-TOP SOLUTIONS

Set-top solutions involve modifications of the technology currently used in tuner-descramblers. All have the advantage that advanced features such as smart on-screen program guides, subject search menus and recording assistance can be accommodated. They also have the advantage that

The advantage that this device offers is simultaneous access to two, rather than a single channel. The two channels can be any combination of basic, tier or premium services.

The limitations are that it doesn't get rid of the redundant remote control, or restore the tuning capabilities of the TV or VCR. Also, it doesn't permit access to more than two channels.

Bypass Switches

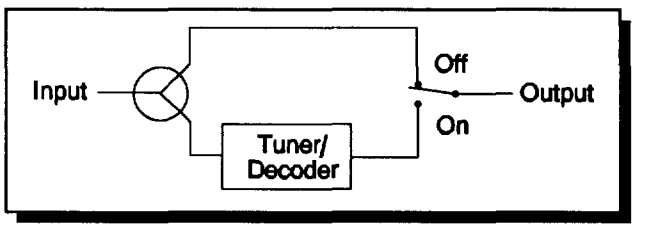


Figure 3: Converter With Bypass Switch

One currently available, low-cost, option from several manufacturers is a switch that completely bypasses the box when it is turned off. That permits all non-scrambled signals to be delivered simultaneously to VCR and TV, but not at the same time as any scrambled signal.

Unfortunately, if cable operators must scramble tier signals because of the anti-buy-through and must-carry provisions of the Cable Act, then only the Basic Tier channels will be available in the bypass position. Also, it means that the customer must use the converter's remote when tuning scrambled channels and the TV or VCR remote when the converter is off.

Bypass Filters

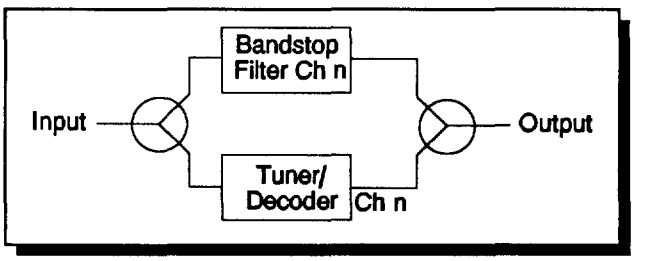


Figure 4: Converter With Bypass Filter

A basic bypass converter splits the input signal. One leg feeds a conventional tuner/ descrambler whose output is on a fixed channel. The other leg passes through a band-stop filter which removes all signals from the converter output channel, but passes the rest of the spectrum. The two legs are combined into a single output which includes nearly all the input channels, plus the converter-selected channel, which may be any channel, whether scrambled or not. This product is currently available from one converter manufacturer and is a moderate-cost option.

If operators need to scramble tier channels, customers will be limited to simultaneous access to the Basic Tier channels plus any one other selected channel.

Basic Bypass Converter with Trapped Basic Tier Service

If, as some expect, the percentage of subscribers who take only the Basic Tier is low, then it might be practical to block access to tiered services in such homes using traps, (despite their being possibly on non-adjacent channels). If that were done, then the tiered services would not have to be scrambled and the Basic Bypass Converter solution would allow simultaneous access to all non-scrambled services plus the selected scrambled service. With future upgrades to converters, the scrambled service could be HDTV or a digitally compressed service, as well as

an NTSC channel. The cost of the multiple-traps required to deliver only Basic Tier services may be a problem, depending on the channel positions of the must-carry broadcast stations.

BROADBAND SOLUTIONS

Traps.

These are the original signal control technology and are still in widespread use, particularly in rural and smaller systems. There are two types: *negative traps* work by notching out the visual carrier of the signal to be denied, while *positive traps* work by notching out an interfering carrier intentionally inserted at the headend.

The advantages of the trapped solution are that it meets all the consumer interface tests in the Act for all levels of service (including additional outlets) and has the lowest initial capital cost of any option.

Against its advantages must be considered the disadvantages:

- ***Poor Solution for Tier Protection.*** Controlling access to tiered services separately from the Basic Tier is very difficult with non-contiguous channels using traps because of the number and awkward configuration required.

- ***Security.*** While a properly installed and functioning negative trap offers a reasonable degree of security, traps that drift or are tampered with fail to block their designed channels without offering physical evidence of malfunction. Positive traps are worse: the basic scrambling is easily defeated and stolen traps can be installed inside the house where they are difficult to discover.

- ***Loss of Signal Strength.*** Each trap inserted in a drop adds to the total loss: greatest in adjacent channels, but also across the entire spectrum. The degree of this effect increases as the protected channel increases in frequency so that traps are typically not

traps, this effect increases with frequency, limiting the channels over which the technology is useful.

- *Lack of Adaptability to New Technologies.* Traps are not expected to have the ability to control digital transmissions as will be used for both HDTV and digitally compressed signals.

Interdiction

Interdiction works by

Against these advantages must be considered the disadvantages:

- ***Higher Initial Cost.*** Unlike addressable set-top descramblers, which are normally installed only in the homes of subscribers who take premium service levels, interdiction units (which cost as much or more per port as set-top descramblers) are generally installed at every tap location where there are one or more active customers. Since they are not compatible with existing scrambling systems, incremental installation (co-existing with conventional scrambling systems) is difficult.

- ***Reduced Trunk/Distribution Security.*** Against higher drop security must be balanced the risk of transporting premium channels in the clear in the trunk and distribution networks, particularly a problem in multiple-unit dwellings and, generally, in urban environments.

- ***Power Requirements.*** Unlike passive taps, the units must be powered, adding to operational costs.

- ***Digital Compression Limitations.*** The broadband technology used in interdiction has no way to control digitally compressed signals, so future implementation of that technology will require independent control hardware.

Broadband Descrambling

Broadband descrambling is not a proven technology. Rather, it is a proposed system that utilizes digital signal processing technology to allow simultaneous descrambling of any combination of conventionally sync-suppressed scrambled TV signals that are authorized. Like interdiction, it could be installed anywhere along individual customer's drop cables. The technology has been prototyped and demonstrated, but it has not been developed as a product. Because of this, its effectiveness, cost and features are unknown.

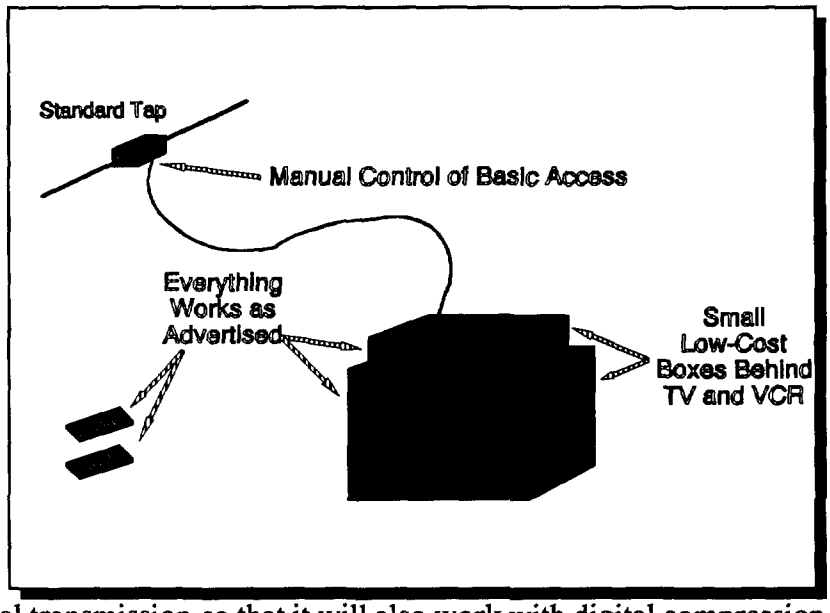
Unlike interdiction, broadband descrambling offers compatibility with the most common scrambling technology. Thus broadband descrambling could be installed incrementally in a system already using descramblers and systems would realize the trunk line security resulting from headend scrambling of all optional services. Also, it is theoretically possible to further scramble non-selected channels, thus increasing security.

One limitation of the technique is that it is not compatible with all scrambling schemes. Thus, should there be a major violation of scrambling security, operators would be limited in available countermeasures.

Another limitation of broadband descrambling is that it requires time synchronization of all controlled channels at the headend. This must be done carefully so as not to increase overall system distortion materially increases headend cost, which is particularly a problem in smaller systems who must amortize such costs over a smaller subscriber base.

In summary, broadband descrambling is not an existing technology and needs further work and field testing before it can be considered a viable solution.

DECODER INTERFACE



The Decoder Interface, as currently defined,[11] is a low-cost connector that can be included on TVs and VCRs to provide a loop-through for the video and audio signals after tuning and detection. It was designed so that all sync suppression and baseband scrambling systems then known could be accommodated in a tuner-less configuration behind the set. Currently, extensions are being considered to accommodate digital transmission so that it will also work with digital compression and HDTV.

The Decoder Interface solution offers many advantages:

- *Lower Cost Than Set-Top Descrambler* — By eliminating the redundant tuner, remote

descrambler on its way to the TV antenna terminals. With that installation option, the device should be able to access most advanced guide features.

Since both HDTV and Digitally Compressed NTSC channels are to be transmitted in standard 6 MHz wide channels, if the multiport definition is slightly expanded to require passage of not only the detected signal, but the full-bandwidth pre-detection signal, then both new technologies can be accommodated in a multiport type device.[12].

Set forth on the next page is a compatibility chart which summarizes the degree of compatibility offered by the various solutions discussed herein. Since "compatibility" is not defined in the 1992 Act, solutions which offer substantial compatibility at low cost should be accepted for existing cable operations.

[12] It has been suggested that instead of providing a multiport jack for a descrambling adapter, the industry agree on a common scrambling method (as was done with Videocipher in satellite feeds) so that set manufacturers could build the descramblers in all new receivers. In general, the cable industry feels that the incentive for pirates to break any such system would be very great. Should it be defeated, as happened on a massive scale to the Videocipher system, it would be very difficult to upgrade or change a nationwide security system. For that reason, that solution is not considered viable

COMPATIBILITY CHART

The chart summarizes the degree of compatibility of various solutions with the Cable Act consumer interface requirements and extensions to HDTV and digital compression. It also shows the degree of addressable control provided, relative capital costs for full deployment and the practicality of incrementally deploying it where existing set-top descramblers are in use. Finally, the degree of signal security is shown. Shaded cells indicate areas in which a technology is superior. Relative costs and security are indicated by "+" (greater), "-" (lessor), or blank (about the same), relative to standard set-top descramblers.

Technology	Cable Act Consumer Compatible	Addressability			Future Technologies		Relative NTSC		Incremental Deployment
		Basic *	Tier	Prem	HDTV	Comp.	Security	Cost	
Existing Technology									
Set-top Converters	Partial	No	Yes	Yes	Replace	Replace			n/a
Traps	Yes	No	No	No	No	No	-	-	n/a
Set-top Converter Modifications									
Dual Descrambler	2 chan. only	No	Yes	Yes	Replace	Replace or Augment	+	+	Yes
Bypass Switch	Basic only	No	Yes	Yes			+		Yes
Bypass Filter	Basic + 1 other chan.	No	Yes	Yes			+		Yes
Bypass Filter + Trapped Tier	Basic, Tier & 1 Prem	No	No	Yes					Yes
Broadband Solutions									
Interdiction	Yes	Yes	Yes	Yes	Yes	Add Bypass Digital Converter	+	+	No
Broadband Descrambling	Yes	Yes	Yes	Yes	Yes		?	?	?
Decoder Interface Solutions									
Decoder Interface	Yes	No	Yes	Yes	Augment		+	-	Yes

*Note: Basic service addressability can be provided with any technology through use of an addressable switch at the tap ("addressable tap") for an added cost of approximately $20-30 per passing.

CONCLUSIONS

It can been seen from the chart that, except for existing single channel converters (and possibly those with just a bypass switch), all of the solutions discussed meet the specific requirements listed in the Cable Act of 1992. Some, on the other hand, go far beyond the minimum requirements in both consumer friendliness and extensibility to future technologies.

The solutions each offer some unique advantages:

- Traps offer few consumer interface problems, but are plagued by their lack of addressability, poor security and unavoidable picture degradations. Nevertheless, they are probably the most cost-effective solution for small and/or rural systems.

- Various modifications to conventional set-top converter/descramblers (especially the bypass filter) go a long way towards overcoming the limitations of standard units. They have the advantage that they can be installed as required and co-exist with other converters and/or multi-port equipped receivers. Also, while converter-based solutions require replacement to accommodate control over HDTV or digitally compressed channels, that can, also, be done on an incremental basis. If operators choose to scramble, rather than trap, tiered services, they realize a higher overall security and flexibility, but at the expense of some consumer compatibility.

- The broadband solutions offer the greatest degree of consumer friendliness at first installation, controlling both NTSC and broadcast format HDTV without any hardware change-out required. They also offer higher drop security than conventional scrambling and operational benefits in controlling access to basic, as well as optional services. Against this, they have a very high first installation cost which will limit their cost-effective installation and, because trunk and feeder signals are transmitted in the clear, offer less security in some environments.

- The Decoder Interface approach offers the best benefit/cost ratio of any of the solutions. The multiport units are expected to cost less than conventional set-top boxes so that, even with the additional cost of the jack, the total cost to the consumer will be substantially less than for a conventional converter. Not only that, but initial installation and later upgrading to HDTV and digitally compressed services can be done incrementally, and for less cost than a full converter change out

RECOMMENDATIONS

Given the myriad possible solutions to the problem of consumer-friendly delivery of cable services, InterMedia respectfully recommends that the Commission:

- Recognize that no single technology will fit all situations. System size, density, existing control technology, plans for introducing new technologies, rebuild schedules and many other things will affect the optimal choice. The FCC rules should be sufficiently flexible to accept any solution that satisfies simultaneous access to two channels, without requiring simultaneous access to all premium services.

- Avoid adopting regulations which hamper the development of digital compression by forcing the same standards on it as on analog channels. The most likely uses for digital compression are for delivery of multi-channel PPV and various narrow-cast premium services. These are not the sort of services that are "skimmed" the way broad interest programming is, and, therefore, are not at the root of subscriber dissatisfaction over tuning limitations. Should the nature of digital services evolve into general programming, the rules can be revisited.

- [redacted]

VI. CONSUMER EQUIPMENT FEATURES

From the above discussion, it is apparent that most of the technical solutions to the interface issues require delivery of cable signals directly to customers' reception equipment. For that reason, it is very important that performance and equipment features be carefully examined.

The NOI requests information on features and performance of consumer reception equipment that need to be controlled to assure compatibility when connected to a cable system. InterMedia suggests that it is first necessary to define carefully what categories of device should be regulated, and then determine what characteristics should be controlled and the appropriate degree of control. With respect to the latter, it is suggested that the Commission consider three classes of characteristics:

- Those which potentially cause interference to other subscribers or non-subscribers,
- Those which assure some minimal acceptable degree of reception when connected to a properly operating cable system, and
- Those which may be cost effective in solving the consumer interface problems discussed above.

DEVICES WHICH SHOULD BE COVERED

InterMedia suggests that two simple test should be used to determine whether a device should be regulated as a "Cable-Ready" device within the meaning of the Act:

- *Extended Tuning Range.*

  InterMedia respectfully suggests that it would be a mistake to define such sets only by the principle adjective used in their title. Otherwise, the market will simply be flooded with devices marketed as "cable-friendly" or some other moniker intended to imply compatibility without having to actually meet any technical requirements. A better, non-ambiguous test is whether the device tunes to channels used by cable systems and not by over-air broadcasting.

- *Suitable for Direct Connection to Cable Systems.*

  The Part 76 rules specify cable system's performance to the point of first connection to a subscriber device. As will be detailed below, the characteristics of whatever device is first connected to a cable system are critical to assure both non-interference to others and a reasonable expectation of functionality. Thus any such device should be regulated under the new rules. While the Act specifically identifies TVs and VCRs, the rules must apply to customer-owned converters as well. This is especially important since the Act goes to some length to assure that customers have the right to purchase their own converters from outside suppliers and these would otherwise be covered only by the

minimal requirements of Part 15.[13] Since the main use of such converters is to convert non-cable-ready television equipment into cable-ready television equipment (by extending the tuning range to cover the cable channels), it is also consistent with the intent of the law.

InterMedia feels strongly that devices meeting these two tests should be required to meet the following characteristics. At the very least, specifications that assure a lack of interference with other subscribers and non subscribers should be mandated and, further, devices which do not meet minimal performance features and standards for connection to cable systems should be appropriately and prominently labelled as a warning to potential purchasers of possible compatibility problems.

CHARACTERISTICS REQUIRING PERFORMANCE LIMITS

Having decided which devices should be regulated, the next question is which characteristics of such devices should be regulated to achieve the aims of the new law. The following seem to meet the standard. InterMedia wishes to point out that even low-cost cable converters typically meet all of the suggested performance criteria, thus they should not require a major engineering effort or impose extraordinary product costs on television set manufacturers.

Characteristics Which Cause Interference to Others.

Several properties of reception equipment can cause interference to reception by other subscribers, to non-subscribers, or to other users of the radio spectrum. For each property, the suggested performance limit is given, followed by the technical justification.

No internally generated signals with frequencies between 54 and 1000 MHz shall be present at the input terminals with a level in excess of -33 dBmV.

Cable operators are required, under Part 76 rules to maintain at least 18 dB of isolation between subscribers to minimize interference. In actuality, most taps sold are specified to have at least 20 dB of port-to-port isolation. Additionally, losses in drop cables add to the isolation. In an apartment situation, the connecting drop cables may be only 25 feet or so long, adding another 2 dB of total isolation.

The minimum signal level delivered by the cable operator must be at least 0 dBmV. Thus the maximum tolerable local oscillator leakage is:

Minimum Desired Signal Level	0 dBmV
- Maximum allowable interference level	-55 dB
= Maximum LO at interfered with subscriber	-55 dBmV
+ Subscriber Isolation	22 dB
= Maximum Allowable LO Leakage	**-33 dBmV**

This specification only needs to be met for LO frequencies which fall within the operating range of cable systems (a number which has risen to 1 gHz in 1992). Cable converter manufacturers have solved the problem long ago (along with the image problem detailed below) by using double conversion reception in which the first LO falls above the cable system spectrum.

These problems can be difficult to uncover because they are transitory. The impaired receiver must be on a channel which is suffering from signals out of the other device. Changing either device's channel may temporarily eliminate the problem.

Another source of interfering back-fed signals is all the digital circuits in modern TVs and VCRs. Digital circuitry is used in tuners, remote controls, on-screen displays and field stores for VCRs and picture-in-picture systems. Digital signals have an abundance of harmonics which can interfere with reception. Even switch-mode power supplies have troublesome harmonics.

- Ingress Signals Appearing at the Input Terminals.

When the device is subject to an external field of 1 volt per meter at any frequency between 54 and 1000 MHz, the level of the external signal appearing at the input terminals shall not be in excess of -33 dBmV. This parameter shall be met in both operating and non-operating conditions.

Sometimes, due to inadequate shielding, receiving equipment picks up television or communications signals directly on its internal wiring. One symptom of this pickup is ingress interference (commonly called direct pickup or DPU) which affects the subscriber and is discussed below under performance issues. Another aspect, however, is the appearance of these signals at the input terminals where they can effect neighboring subscribers, just as LO leakage can. The picture degradation can vary from "ghosting", if the same video information is present on the cable and off-air channel, to various kinds of beats, if the interfering signal is from a different radio service.

While the degree of tolerable leakage should be the same as for LO signals (-33 dBmV), it is more difficult to specify the maximum field strength of the off-air signal and the measurement technique. Both the Electronic Industries Association and CableLabs are looking into this problem. If it could be determined what percentage of television households live in what maximum field strength (and the cost of various degrees of shielding) the Commission could simply decide where the "knee of the curve" was in cost-benefit ratio in determining how many television viewers to protect from ingress problems.

The Canadian government has long held manufacturers to a standard of 100 mV/meter, however many feel that a larger percentage of US television households live in high RF environments. A 1 Volt/meter standard extending from 50 to 1000 MHz (the anticipated operating range of modern cable systems) is suggested as an interim level.

- Re-radiation of Cable Signals from Receiver Wiring.

When the input terminals of the device are connected to a properly matched source whose signal level is +20 dBmV and whose frequency is varied from 54 to 1000 MHz, the external radiated field from the device shall not exceed the limits prescribed for cable systems in FCC Rules, Part 76.605(a)(12). If the device is supplied with interconnecting cables, the measurement shall be made with the furnished cables attached in the normal configuration. This parameter shall be met in both operating and non-operating conditions.

While cable systems are held to a standard of 20 μV/m leakage fields (measured at 3 meters from any part of the plant), consumer equipment is only regulated as to the